Department for Education

Brunel University London

Enhancing Mathematical Learning through Talk

Think-talk-maths: creating opportunities for talk

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Beginning with some end points to our story: insights into impact

'I was talking to my job share partner last week and she said that the turn around in maths has been powerful. I think it's the overall effect the project has had, doing all these little activities and having an open mind has changed not only the way we plan, deliver and teach maths but the way the children respond!' *(Project teacher, Jenny L)*

'Pupils' confidence has improved, parents have commented that the children have really enjoyed maths and are really engaged (pupils who had cried before about doing maths, now really enjoy it) *(Project teacher)*

‘*This week we are in the process of doing the end of term project assessment with the children. At the start of the project, each class took approximately two days to complete. However, this time it is taking a lot longer as the children have far better, more detailed responses and won’t stop discussing or sharing their ideas! A positive result of the project I think!*
(Project teachers Abby F, Maeve O’N and Anna D)

‘I found re-doing the assessments again very rewarding. I noticed in terms of my own professional development, how differently I delivered the questions and also how I interpreted the children’s responses more clearly than back in September.
(Project teacher, Hayley C)

back to the beginning: mindful of the context: March 2014

- revised national curriculum to be introduced in September 2014
  - focused on the NC aims of ensuring that all pupils work towards fluency; can reason mathematically, and solve problems

- assessment requirements revised
  - devised monitoring tasks with focus on number, fractions, counting, calculating, measures (money) and encouraging children to explain their thinking (reasoning)

…more context…

- a focus on ‘mastery’ with no universally agreed definition
  - focused on engaging pupils and developing confidence (and competence)

  increasing interest from policy makers and schools in national and international approaches to maths teaching
  - focused on effective strategies for listening to children & promoting maths talk that could enhance any teaching approach

- Ofsted ‘thinking’ for example, Made to Measure Report (2012)
  how well does teaching foster understanding and pupils skills in problem solving
  - focused on increasing opportunities for children to investigate together and share their thinking

Talk in mathematics should not be seen simply as a rehearsal in class of the vocabulary of mathematics, ... It should extend to high-quality discussion that develops children's logic, reasoning and deduction skills, and underpins all mathematical learning activity. The ultimate goal is to develop mathematical understanding – comprehension of mathematical ideas and applications.'

Williams (2008)

A high-quality mathematics education [therefore] provides a foundation for understanding the world; the ability to reason mathematically, an appreciation of the beauty and power of mathematics, and a sense of enjoyment and curiosity about the subject.

National Curriculum in England Sept. 2013

Where to begin? creating opportunities for thinking, talking, engaging and enjoying mathematics: think-talk-maths

- the nature and framing of the maths tasks (challenges) on offer – do they 'demand' engagement and talk
- the kinds of prompts available to teachers to extend and enhance pupils' thinking (reasoning) and talk
- organisational features that support pupil-pupil and pupil-teacher (adult) talk

- informed by teachers' professional knowledge and research from the education community (for example, Alexander, Bowler, Barnes, Mercer, Mason, Murphy, Myhill, Rowland)
- enhanced by teachers' creative thinking and choices

the nature and framing of tasks: starting points that 'demand' engagement & mathematical talk

- reasoning tasks (challenges)
- co-operative 'pieces of the puzzle' and other games – ATM examples on display and worked Year 5 example from Project teacher, Jemma

- think-talk-maths boxes and other props
- children's literature

Making choices

- provide flexibility for teachers in terms of content and organisation (whole class, groups, pairs and trios)
- the framing of the task is familiar to the children and so exploration of the maths content becomes the key focus
- provide opportunities for children to make connections in their learning

An invitation to a picnic….. worked example from Project teacher, Jenny T

Working with whole class on multiples of 3

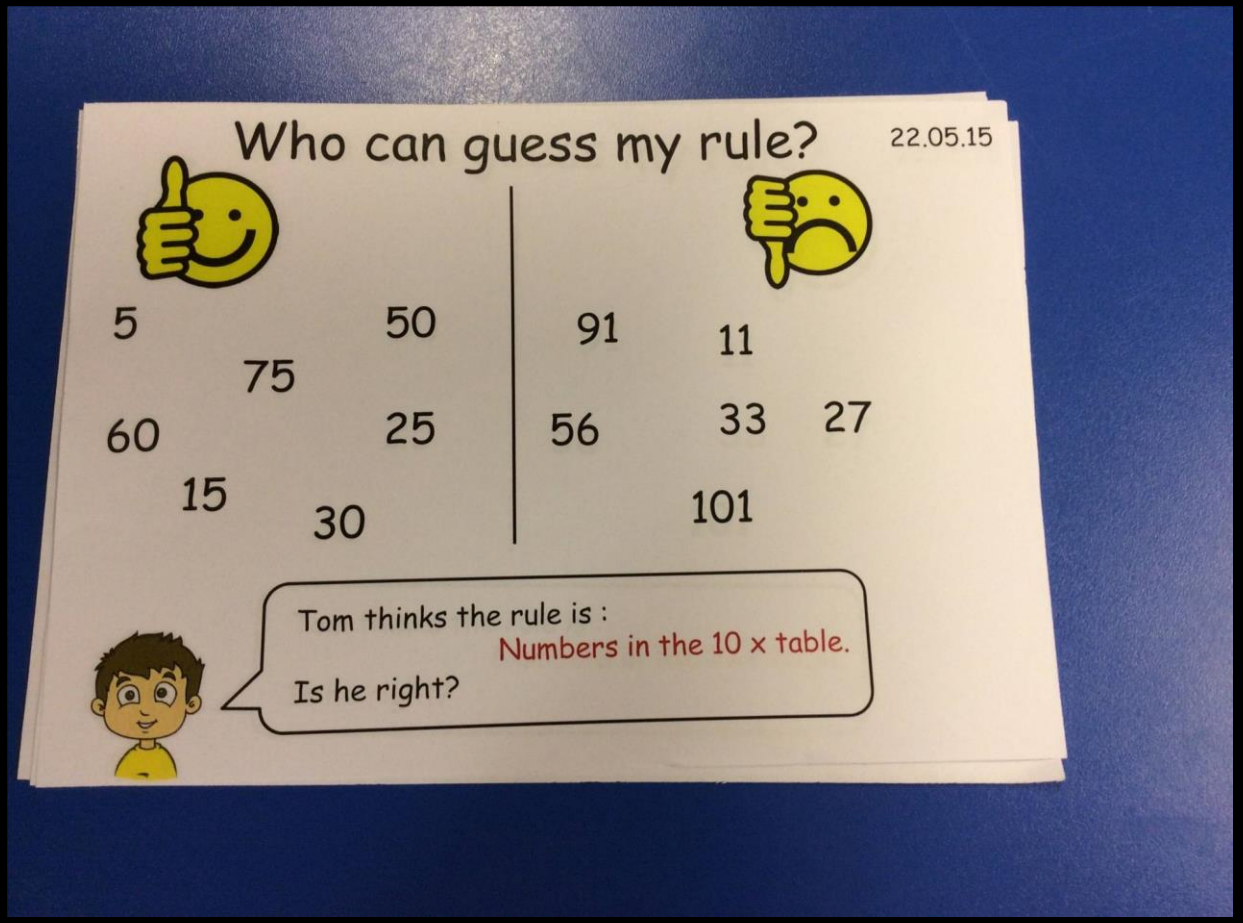
Children write own number between 0-50 on individual whiteboards
Children ask: *Can I come to your party [picnic]*
Teacher invites some children but not others to join the party
Children with multiple of 3 number stand at front (for party)

Teacher asks: *'what's the rule?'*
Children discuss in talk trios – effective for scaffolding the less Confident children
Teacher asks: *what other numbers could join the party?*

An invitation to a picnic: worked example, project teacher, Ashley H

- Used at the end of a lesson as a motivator and for checking understanding
- Children always request to play the game and have become excellent at offering suggestions for rules half way through
- Vocabulary has improved particularly for children with English as an Additional Language
- Modelled language structures for example, ‘it could be ___ because _____’
- TA trained so that the class can be split into two groups
- TA has used the invitation to a picnic with other classes

What's my Rule? Worked example, Project teacher, Emma C



I think no because it is in the 5x table because 3, 6, 24, are not in the 5x table.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Odd one out: worked examples from Project teacher, Rebecca R

Make each one of the items in turn the odd one out

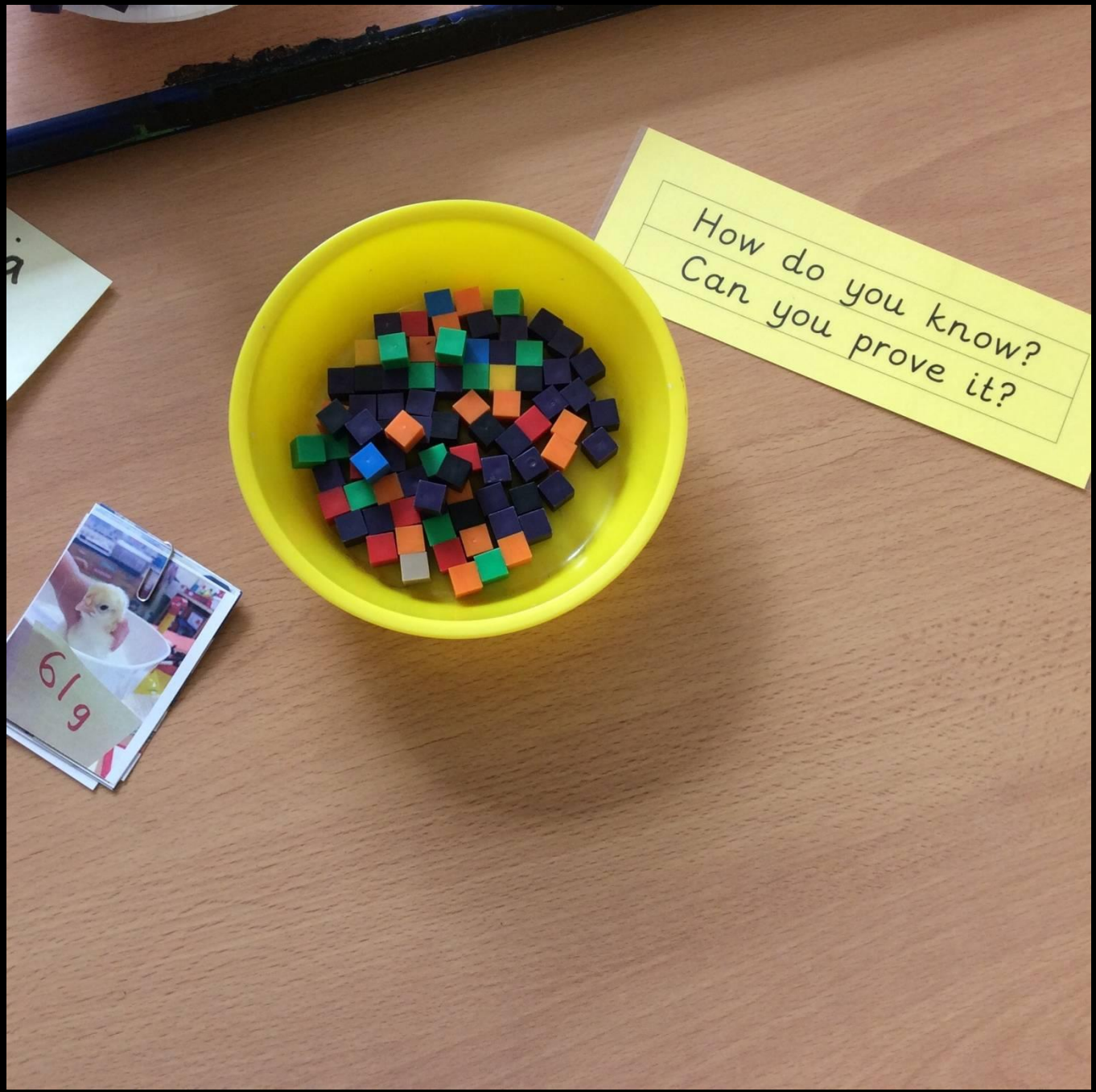
5	55	73
12	24	31
pentagon	hexagon	triangle
measuring tape	ruler	number square

Odd One Out!

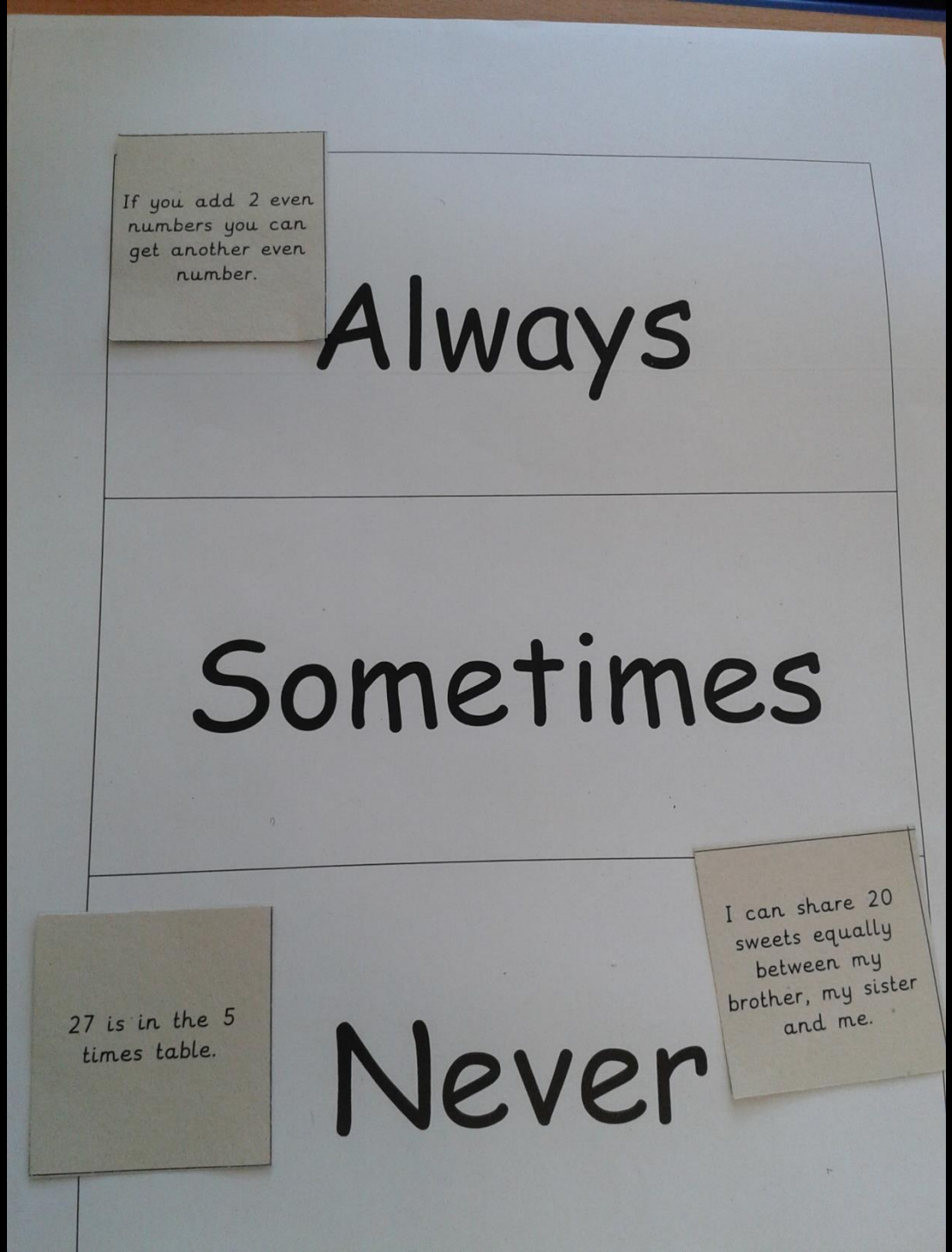
...because...

Odd One Out!

...because...


How do you know?
Can you prove it?
619


You can add 9 to a number by adding 10 and subtracting 1.

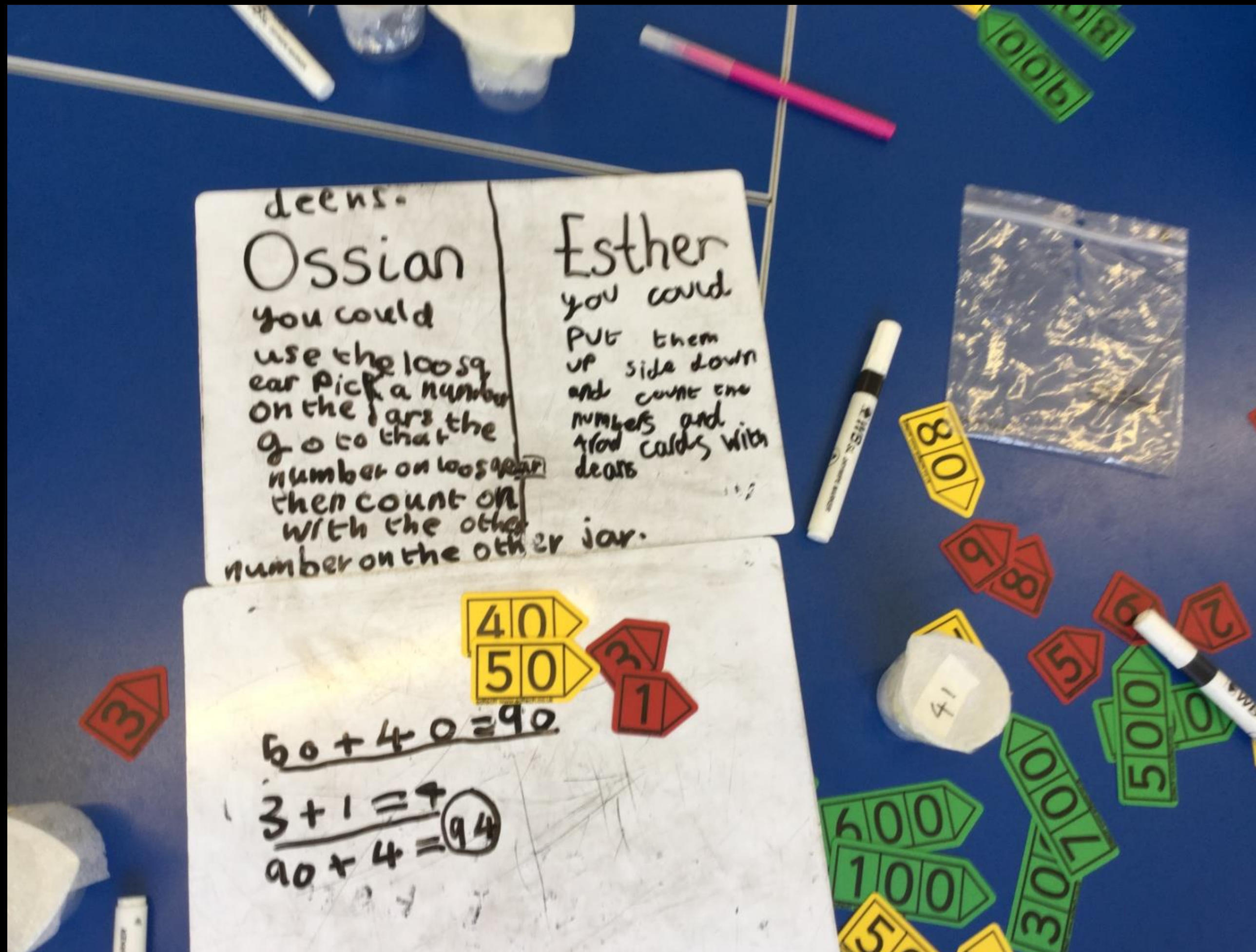

If you add 2 even numbers you can get another even number.
Always
Sometimes
I can share 20 sweets equally between my brother, my sister and me.
27 is in the 5 times table.
Never

Organising for talk: talk trios* reflections from Project teachers, Nicola W and Jo C

Project teacher, Nicola

- Mixed ability trios so that all children can achieve – maths isn't just for 'clever' children
- Children choose their own partners
- Trios in all lessons not just maths
- Some dominant children in the trios but all the children know that they are expected to join in the talk and to feed back to the class
- Some teacher support to encourage less vocal children to speak for the group
- Can't see myself returning to partners. Talk to your learning team!

* Talk trios adopted from project carried out by researchers at the University of Exeter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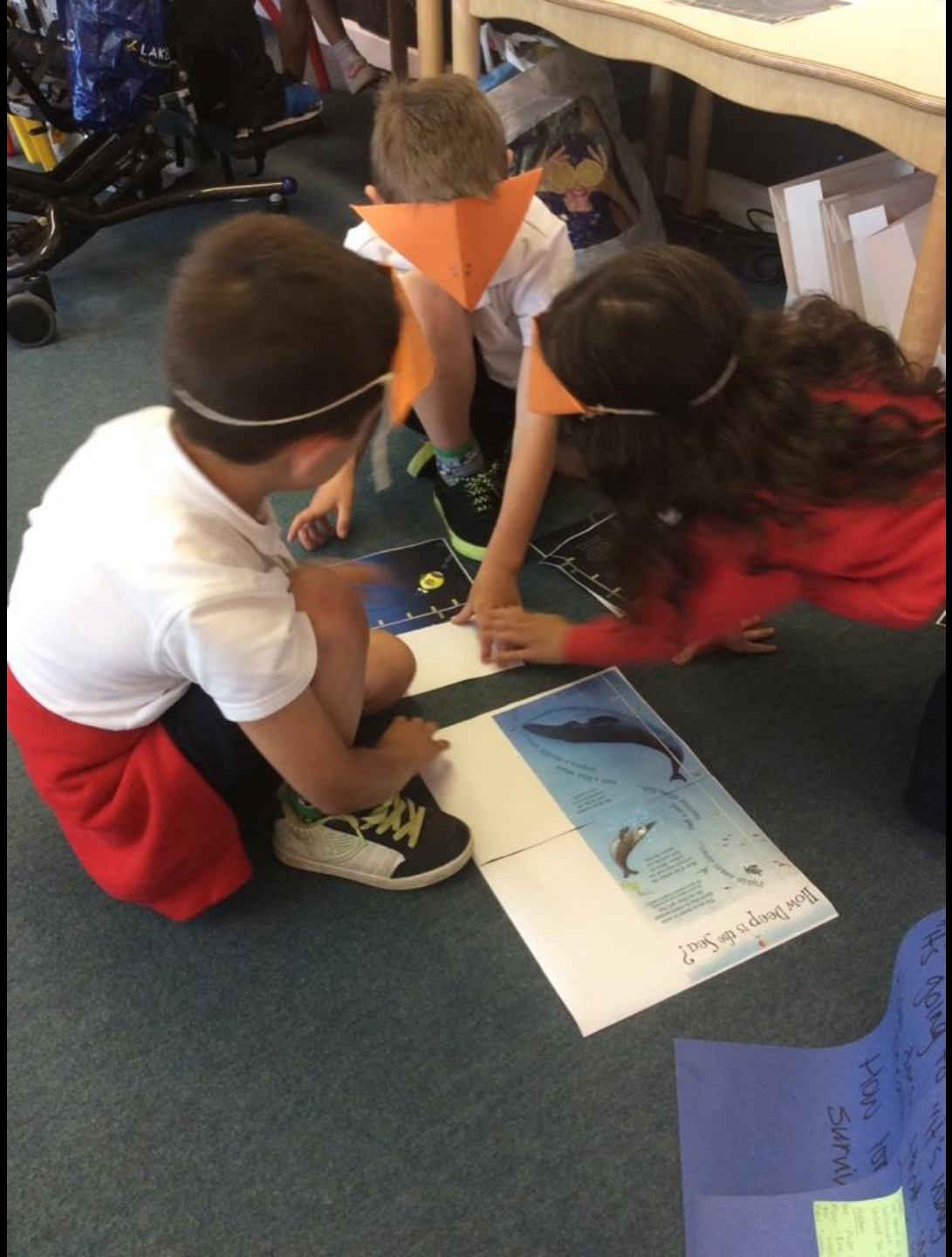
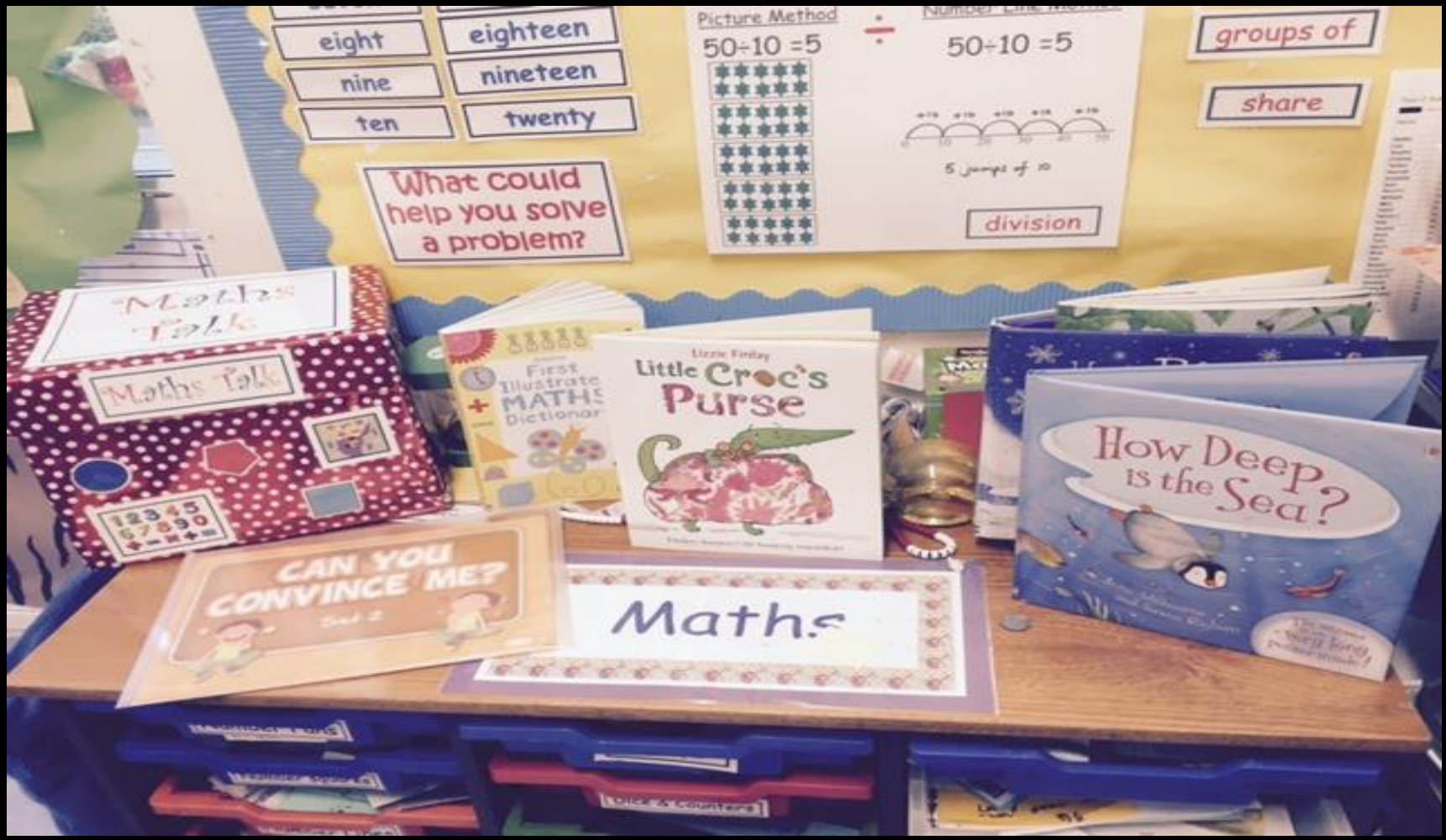
Ossian
you could
use the 100 sq
ear Pick a number
on the jars the
go to that
number on 100 square
then count on
with the other
number on the other jar.
Esther
you could
Put them
up side down
and count the
numbers and
grow cards with
dears
40
50
3
1
50 + 40 = 90
3 + 1 = 4
90 + 4 = 94
41


How Deep is the Sea?

‘Challenge Friday’ : Think-talk-maths box and other challenges, Project teacher, Rebecca R




MARVELOUS MAT
Can you complete the challenge this week?
BCCC
zero
one
two
three
four
five
six
seven
eight
nine
ten
eleven
twelve
thirteen
fourteen
fifteen
sixteen
seventeen
eighteen
nineteen
twenty
What could help you solve a problem?
Little Croc's Purse
Maths